Claims

1. A method of introducing genetic material into cells of an individual comprising the steps of:

a) contacting cells of said individual with a polynucleotide function enhancer;

b) administering to cells of said individual, a nucleic acid molecule;

wherein said nucleic acid molecule is free of retroviral particles.

2. The method of claim 1 wherein said polynucleotide function enhancer is a bupivacaine.

3. The method of claim 1 wherein said nucleic acid molecule comprises a nucleotide sequence that encodes a protein and is operably linked to regulatory sequences.

4. The method of claim 1 wherein said nucleic acid molecule comprises a nucleotide sequence that encodes a protein which comprises at least one epitope that is identical or substantially similar to an epitope of an antigen against which an immune response is desired, said nucleotide sequence operably linked to regulatory sequences.

5. A method of immunizing an individual against a pathogen comprising the steps of:

a) contacting cells of said individual with a polynucleotide function enhancer;

b) administering to cells of said individual, a nucleic acid molecule that comprises a nucleotide sequence that encodes a protein which comprises at least one epitope that is identical or substantially similar to an epitope of a pathogen antigen, said nucleotide sequence being operably linked to regulatory sequences;

wherein said nucleic acid molecule is free of retroviral particles and said nucleotide sequence is capable of being expressed in said cells.

6. The method of Claim 5 wherein said polynucleotide function enhancer is bupivacaine.

7. The method of Claim 5 wherein said nucleic acid molecule is a DNA molecule.

8. The method of Claim 5 wherein said protein is a pathogen antigen or a fragment thereof.

9. The method of Claim 5 wherein said nucleic acid molecule is administered intramuscularly.

10. The method of Claim 5 wherein said pathogen is a virus selected from the group consisting of: human immunodeficiency virus, HIV; human T cell leukemia virus, HTLV; influenza virus; hepatitis A virus, HAV; hepatitis B virus, HBV; hepatitis C virus, HCV; human papilloma virus, HPV; Herpes simplex 1 virus, HSV1; Herpes simplex 2 virus, HSV2; Cytomegalovirus, CMV; Epstein-Barr virus, EBV; rhinovirus; and, coronavirus.

11. The method of Claim 5 wherein said pathogen is HIV and said nucleic acid molecule comprises a nucleotide sequence sequences that encodes an HIV protein.

12. The method of Claim 5 wherein said pathogen is HIV and said nucleic acid molecule comprises a nucleotide sequence sequences that encodes more than one HIV structural protein.

13. The method of Claim 5 wherein said pathogen is HIV and said nucleic acid molecule comprises a nucleotide sequence sequences that encodes more than one HIV regulatory protein.

14. The method of Claim 5 wherein at least two or more different nucleic acid molecules are administered to different cells of an individual; said different nucleic acid molecules

each comprise nucleotide sequences encoding one or more pathogen antigens of the same pathogen.

15. The method of Claim 5 wherein said polynucleotide function enhancer and said nucleic acid molecule are administered simultaneously.

16. The method of Claim 5 wherein:

said individual is a human;

said polynucleotide function enhancer is bupivacaine;

said pathogen is human immunodeficiency virus;

said nucleic acid molecule is DNA and comprises a DNA sequence that encodes HIV structural proteins *gag* and *pol* with a deletion of the *psi*, said DNA sequence that encodes *gag* and *pol* operably linked to a rous sarcoma virus enhancer, a cytomegalovirus immediate early promoter and an SV40 minor polyadenylation signal and optionally an SV40 origin of replication.

17. The method of Claim 16 wherein said DNA sequence further comprises an HIV *rev* response element and a deletion of HIV integrase.

18. The method of Claim 17 wherein said DNA sequence further comprises an HIV splice acceptor.

19. The method of Claim 16 wherein said DNA molecule further comprises a DNA sequence that encodes sequence further comprises HIV *rev* operably linked to an SV40 promoter and an SV40 minor polyadenylation signal and optionally an SV40 origin of replication.

20. The method of Claim 19 wherein said DNA sequence that encodes *rev* additionally encodes HIV *vpu* and HIV *env*.

21. The method of Claim 19 wherein said DNA sequence that encodes *gag* and *pol* further comprises an HIV *rev* response element and a deletion of HIV integrase.

22. The method of Claim 21 wherein said DNA sequence that encodes *gag* and *pol* further comprises an HIV splice acceptor.

23. The method of Claim 5 wherein:

said individual is a human;

said polynucleotide function enhancer is bupivacaine;

said pathogen is human immunodeficiency virus;

said nucleic acid molecules is DNA and comprises a DNA sequence that encodes HIV proteins *rev*, *vpu* and *env* operably linked to a rous sarcoma virus enhancer, a cytomegalovirus immediate early promoter and an SV40 minor polyadenylation signal and optionally an SV40 origin of replication.

24. The method of Claim 5 wherein:

said individual is a human;

said polynucleotide function enhancer is bupivacaine;

said pathogen is human immunodeficiency virus;

two different DNA molecules are administered to different cells of an individual;

one of said nucleic acid molecules is DNA and comprises a DNA sequence that encodes HIV structural proteins *gag* and *pol* with an deletion of the *psi*, said DNA sequence that encodes *gag* and *pol* operably linked to a rous sarcoma virus enhancer, a cytomegalovirus immediate early promoter and an SV40 minor polyadenylation signal and optionally an SV40 origin of replication; and

the other of said nucleic acid molecules is DNA and comprises a DNA sequence that encodes HIV proteins *rev*, *vpu* and *env* operably linked to a rous sarcoma virus enhancer,

a cytomegalovirus immediate early promoter and an SV40 minor polyadenylation signal and optionally an SV40 origin of replication.

25. A method of immunizing a human against HIV comprising the steps of:

administering to cells of said human, two different nucleic acid molecules; each of said nucleic acid molecules comprising a nucleotide sequence that encodes a protein which comprises at least one epitope that is identical or substantially similar to an epitope of at least one HIV antigen operatively linked to regulatory sequences; said nucleotide sequences being capable of being expressed in said cells; nucleotide sequences of each of said different nucleic acid molecules encode different proteins; said proteins comprise at least one epitope that is identical or substantially similar to an epitope of at least one of the HIV proteins encoded by HIV genes selected from the group consisting of *gag*, *pol* and *env*.

26. A method of immunizing an individual against a disease comprising the steps of:

a) contacting cells of said individual with a polynucleotide unction enhancer;

b) administering to cells of said individual, a nucleic acid molecule comprising a nucleotide sequence that encodes a target protein which comprises an epitope identical or substantially similar to an epitope of a protein associated with cells that characterize said disease operatively linked to regulatory sequences;

wherein said nucleic acid molecule is free of retroviral particles and capable of being expressed in said cells.

27. The method of Claim 26 wherein said polynucleotide function enhancer is bupivacaine.

28. The method of Claim 26 wherein said disease is characterized by hyperproliferating cells.

29. The method of Claim 26 wherein said disease is an autoimmune disease.

30. The method of Claim 26 wherein said nucleic acid molecule is a DNA molecule.

31. The method of Claim 26 wherein said nucleic acid molecule is administered intramuscularly.

32. The method of Claim 26 wherein said nucleic acid molecule comprises a nucleotide sequence that encodes a target protein selected from the group consisting of: protein products of oncogenes *myb, myc, fyn, ras, sarc, neu* and *trk;* protein products of translocation gene *bcl/abl;* P53; EGRF; variable regions of antibodies made by B cell lymphomas; and variable regions of T cell receptors of T cell lymphomas.

33. The method of Claim 26 wherein said protein is selected from the group consisting of: variable regions of antibodies involved in B cell mediated autoimmune disease; and variable regions of T cell receptors involved in T cell mediated autoimmune disease.

34. An pharmaceutical immunizing kit comprising:

a) a first inoculant comprising:

i) a pharmaceutically acceptable carrier or diluent; and,

ii) a first nucleic acid molecule comprising a nucleotide sequence that encodes at least one HIV protein operatively linked to regulatory sequences; wherein said nucleotide sequence is capable of being expressed in human cells;

b) a second inoculant comprising:

i) a pharmaceutically acceptable carrier or diluent; and,

ii) a second nucleic acid molecule comprising a nucleotide sequence that encodes at least one HIV protein operatively linked to regulatory sequences; wherein said nucleotide sequence is capable of being expressed in human cells;

wherein said first nucleic acid molecule is not identical to said second nucleic acid molecule.

35. The pharmaceutical kit of Claim 34 further comprising:

c) a third inoculant comprising bupivacaine.

36. The pharmaceutical composition of claim 34 wherein taken together said first nucleic acid molecule and said second nucleic acid molecule encode HIV proteins *gag*, *pol* and *env*.

37. A pharmaceutical composition comprising

a) a DNA molecule that comprises a DNA sequence that encodes HIV structural proteins *gag* and *pol* with a deletion of the *psi*, said DNA sequence that encodes *gag* and *pol* operably linked to a rous sarcoma virus enhancer, a cytomegalovirus immediate early promoter and an SV40 minor polyadenylation signal and optionally an SV40 origin of replication; and

b) a polynucleotide function enhancer.

38. The pharmaceutical composition of claim 37 wherein said cell stimulating compound is bupivacaine

39. The pharmaceutical composition of claim 37 wherein said DNA sequence further comprises an HIV *rev* response element and a deletion of HIV integrase.

40. The pharmaceutical composition of claim 37 wherein said DNA sequence further comprises an HIV splice acceptor.

41. The pharmaceutical composition of claim 37 wherein said DNA molecule further comprises a DNA sequence that encodes sequence further comprises HIV *rev* operably linked to an SV40 promoter and an SV40 minor polyadenylation signal and optionally an SV40 origin of replication.

42. The pharmaceutical composition of claim 41 wherein said DNA sequence that encodes *rev* additionally encodes HIV *vpu* and HIV *env*.

43. The pharmaceutical composition of claim 42 wherein said DNA sequence that encodes *gag* and *pol* further comprises an HIV *rev* response element and a deletion of HIV integrase.

44. The method of Claim 42 wherein said DNA sequence that encodes *gag* and *pol* further comprises an HIV splice acceptor.

45. A pharmaceutical composition that comprises

a) a DNA molecule that comprises a DNA sequence that encodes HIV proteins *rev*, *vpu* and *env* operably linked to a rous sarcoma virus enhancer, a cytomegalovirus immediate early promoter and an SV40 minor polyadenylation signal and optionally an SV40 origin of replication; and

b) a polynucleotide function enhancer.

46. The pharmaceutical composition of claim 45 wherein said polynucleotide function enhancer is bupivacaine

47. An pharmaceutical immunizing kit comprising:

a) a first inoculant comprising:

i) a first pharmaceutical composition comprising a DNA molecule that comprises a DNA sequence that encodes HIV structural proteins *gag* and *pol* with an deletion

of the *psi*, said DNA sequence that encodes *gag* and *pol* operably linked to a rous sarcoma virus enhancer, a cytomegalovirus immediate early promoter and an SV40 minor polyadenylation signal and optionally an SV40 origin of replication; and

ii) a polynucleotide function enhancer; and

b) a second inoculant comprising:

i) a second pharmaceutical composition comprising a DNA molecule that comprises a DNA sequence that encodes HIV proteins *rev*, *vpu* and *env* operably linked to a rous sarcoma virus enhancer, a cytomegalovirus immediate early promoter and an SV40 minor polyadenylation signal and optionally an SV40 origin of replication; and

ii) a polynucleotide function enhancer.

48. The pharmaceutical immunizing kit of claim 47 wherein said polynucleotide function enhancer is bupivacaine.

49. A method of treating an individual suspected of suffering from a disease comprising the steps of:

a) contacting cells of said individual with a polynucleotide function enhancer;

b) administering to cells of said individual, a nucleic acid molecule comprising a nucleotide sequence that encodes a protein whose presence will compensate for a missing, non-functional or partially functioning protein or produce a therapeutic effect on the individual, said nucleotide sequence operatively linked to regulatory sequences;

wherein said nucleic acid molecule is free of retroviral particles and capable of being expressed in said cells.

50. The method of Claim 49 wherein said polynucleotide function enhancer is bupivacaine.

51. The method of Claim 49 wherein said nucleic acid molecule is a DNA molecule.

52. The method of Claim 49 wherein said nucleic acid molecule is administered intramuscularly.

53. The method of Claim 49 wherein said nucleic acid molecule comprises a nucleotide sequence that encodes a protein selected from the group consisting of: enzymes, structural proteins, cytokines, lymphokines and growth factors.

54. A pharmaceutical composition comprising:

i) a nucleic acid molecule that comprises a nucleotide sequence which encodes a protein selected from the group consisting of: proteins which comprises at least one epitope that is identical or substantially similar to an epitope of a pathogen antigen; proteins which comprises an epitope identical or substantially similar to an epitope of a protein associated with hyperproliferating cells; proteins which comprises an epitope identical or substantially similar to an epitope of a protein associated with cells that characterize an autoimmune disease; proteins whose presence will compensate for a missing, non-functional or partially functioning protein in an individual; and proteins that produce a therapeutic effect on an individual; and

ii) a polynucleotide function enhancer;

wherein said pharmaceutical composition is free of retroviral particles.

55. The method of Claim 54 wherein said polynucleotide function enhancer is bupivacaine.

56. A pharmaceutical kit comprising:

i) a container that comprises a nucleic acid molecule that comprises a nucleotide sequence which encodes a protein selected from the group consisting of: proteins

which comprises at least one epitope that is identical or substantially similar to an epitope of a pathogen antigen; proteins which comprises an epitope identical or substantially similar to an epitope of a protein associated with hyperproliferating cells; proteins which comprises an epitope identical or substantially similar to an epitope of a protein associated with cells that characterize an autoimmune disease; proteins whose presence will compensate for a missing, non-functional or partially functioning protein in an individual; and proteins that produce a therapeutic effect on an individual; and

ii) a container that comprises a polynucleotide function enhancer;

wherein said pharmaceutical kit is free of retroviral particles.

57. The method of Claim 56 wherein said polynucleotide function enhancer is bupivacaine.

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